ENVIRONMENTAL SAMPLING EFFICIENCY FOR GROUND-WATER WELLS

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The St. Louis District (MVS), Corps of Engineers, manages four separated sites and over 100 properties for remediating low-level radiological contamination. Ground-water conditions are monitored with over 90 wells at the three primary locales. MVS developed procedures with concurrence of regulators to efficiently sample wells and add new wells.

Three procedures were proposed for regulatory review: Sampling Parameter Protocol, Sampling Interval Protocol, and New Well Placement Process. A group of involved hydro geologists reviewed and accepted the procedures. The two protocols allow for algorithm review of sampling data to recommend the subsequent sampling by analyte and interval for each well. The algorithm aids in assessing large data sets and is more objective than the sampling bias of either the owner or regulator. Both of the protocols and the New Well Placement Process are a formalized means to address Data Quality Objectives (DQOs) for ground-water wells.

The two protocols', basic concepts follow. New wells should be sampled for all required analytes five times in two years. Following initial, new-well sampling, subsequent samples should be determined by each analyte's historic values for that well's screen interval and nearby wells. Sampling intervals are periods of 3, 6, 12, 30 or 60 months. Assessing an analyte's sequence of values at a well or spatially related wells may modify the interval for the next sampling. The next sampling period may only be changed by one step of the 5 periods. The algorithm provides objective interval recommendations, which may be revised for cause by the lead geologist, for sampling each analyte at all the wells. Flow charts for the two protocols will be discussed.

Parameter or analyte selection is limited to ROD-specified Contaminants of Concern (COC). Ground-water parameters may be added for flow regime evaluation. The COC concept develops from a risk-assessment of what are the best analytes to monitor. The parameters for the St. Louis Downtown Site (SLDS) have been established in the SLDS' ROD. The North County sites' parameters, for the short term, will include soil Chemicals of Potential Concern and some added analytes to assure protectiveness. The parameter selection for future sampling will consider non-detects or detection levels below background, as applicable.

Parameter sampling intervals are based upon the historic data of the well following the new well's specified sampling. There may be more than one sampling interval for a well depending on the differing analytes. That is, most metals are determined from the same test (Target Analyte List), so the interval for arsenic and cadmium would be determined from the shorter of the two prescribed by the protocol. The interval for dissolved uranium would be determined by the history of uranium alone independent of the metals' interval. The first consideration is whether the last sampling showed the analyte as being above the detection level. If there was a detection for the well's particular analyte, then the interval for the next sampling event would be appraised by the Sampling Parameter Protocol. The sampling interval following the new well samples would be longer if there was never detection for the specified parameter. This latter parameter issue is only used if the Sampling Interval Protocol has not been referenced.

The Sampling Interval Protocol would be utilized if any of the three following analyte conditions were positive. These three analyte conditions include a determination of whether the specified analyte was detected:

- in the same geologic unit of an up gradient well; or
- in the same well cluster but different geologic horizon; or
- in a nearby, recent surface-water or sediment sample with potential connection to that well screen's geologic interval.

The sampling interval would be appraised by the historic values of the analyte and the conditions from that analyte's ambient historic sampling. The algorithm has been effective at resolving objective sampling intervals, assuring that sampling is meeting the program needs while avoiding the expense of over sampling.